



# TOOLS FOR METAL OPTI LINE

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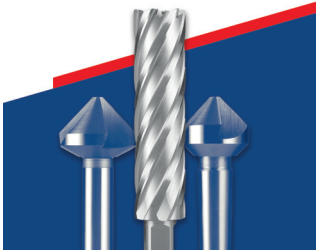


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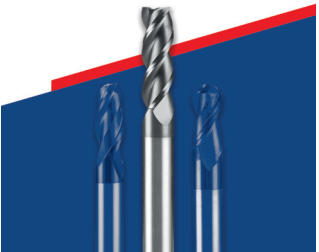
**ROTARY BURRS ..... 5**



**ANNULAR CUTTERS / TREPANNING DRILLS ..... 21**

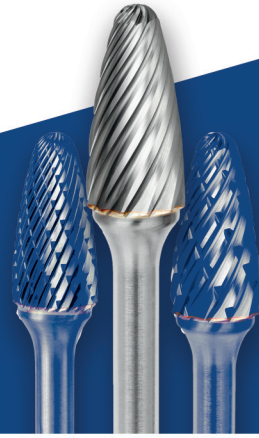


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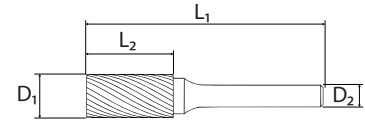
# ROTARY BURRS



|  |    |
|--|----|
| <b>A/ZYA - Cylinder</b> .....              | 6  |
| <b>B/ZYAS - Cylinder with endcut</b> ..... | 7  |
| <b>C/WRC - Ball nosed cylinder</b> .....   | 8  |
| <b>D/KUD - Ball</b> .....                  | 9  |
| <b>E/TRE - Oval</b> .....                  | 10 |
| <b>F/RBF - Ball nosed tree</b> .....       | 11 |
| <b>G/SPG - Pointed tree</b> .....          | 12 |
| <b>H - Flame</b> .....                     | 13 |
| <b>L/KEL - Ball nosed cone</b> .....       | 14 |
| <b>M/SKM - Cone</b> .....                  | 15 |
| <b>J/KSJ - Countersink 60°</b> .....       | 16 |
| <b>K/KSK - Countersink 90°</b> .....       | 16 |
| <b>N/WKN - Inverted cone</b> .....         | 17 |



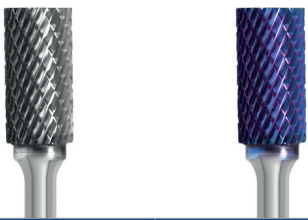
**CYLINDER**



|                 |                 |  |         |
|-----------------|-----------------|--|---------|
| <b>STANDARD</b> | <b>STANDARD</b> |  | Line    |
| DSF             | ALU             |  | Chamfer |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-000-030 |                  | 3              | 13             | 38             | 3              |
| 0641-500-000-060 |                  | 6              | 13             | 50             | 3              |
| 0641-500-000-065 |                  | 6              | 16             | 63             | 6              |
| 0641-500-000-080 | 0641-500-000-508 | 8              | 20             | 65             | 6              |
| 0641-500-000-100 | 0641-500-000-510 | 10             | 20             | 65             | 6              |
| 0641-500-000-120 | 0641-500-000-512 | 12,7           | 25             | 70             | 6              |
| 0641-500-000-125 |                  | 12,7           | 25             | 70             | 8              |
| 0641-500-000-160 | 0641-500-000-516 | 16             | 25             | 70             | 6              |
| 0641-500-000-208 |                  | 8              | 20             | 170            | 6              |
| 0641-500-000-210 |                  | 10             | 20             | 170            | 6              |
| 0641-500-000-212 |                  | 12,7           | 25             | 175            | 6              |

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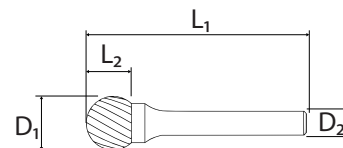
|            |            |  |         |
|------------|------------|--|---------|
| <b>PRO</b> | <b>PRO</b> |  | Line    |
| DSF        | DSF        |  | Chamfer |
|            | BLUE       |  | Coating |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-000-306 | 0641-500-000-406 | 6              | 16             | 50             | 6              |
| 0641-500-000-308 | 0641-500-000-408 | 8              | 20             | 65             | 6              |
| 0641-500-000-310 | 0641-500-000-410 | 10             | 20             | 65             | 6              |
| 0641-500-000-312 | 0641-500-000-412 | 12,7           | 25             | 70             | 6              |
| 0641-500-000-316 |                  | 16             | 25             | 70             | 6              |





**BALL**



| STANDARD | STANDARD |  | Line    |
|----------|----------|--|---------|
| DSF      | ALU      |  | Chamfer |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-015-030 |                  | 3              | 3              | 38             | 3              |
| 0641-500-015-060 |                  | 6              | 5              | 43             | 3              |
| 0641-500-015-065 |                  | 6              | 5              | 50             | 6              |
| 0641-500-015-080 | 0641-500-015-508 | 8              | 7              | 56             | 6              |
| 0641-500-015-100 | 0641-500-015-510 | 10             | 9              | 56             | 6              |
| 0641-500-015-120 | 0641-500-015-512 | 12,7           | 10             | 56             | 6              |
| 0641-500-015-125 |                  | 12,7           | 10             | 56             | 8              |
| 0641-500-015-160 | 0641-500-015-516 | 16             | 14             | 60             | 6              |
| 0641-500-015-190 |                  | 19             | 17             | 63             | 6              |
| 0641-500-015-200 |                  | 25             | 21             | 68             | 6              |
| 0641-500-015-210 |                  | 10             | 9              | 160            | 6              |
| 0641-500-015-212 |                  | 12,7           | 10             | 160            | 6              |



| PRO | PRO  |  | Line    |
|-----|------|--|---------|
| DSF | DSF  |  | Chamfer |
|     | BLUE |  | Coating |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-015-306 | 0641-500-015-406 | 6              | 5              | 50             | 6              |
| 0641-500-015-308 | 0641-500-015-408 | 8              | 7              | 53             | 6              |
| 0641-500-015-310 | 0641-500-015-410 | 10             | 9              | 54             | 6              |
| 0641-500-015-312 | 0641-500-015-412 | 12,7           | 10             | 58             | 6              |
| 0641-500-015-316 |                  | 16             | 14             | 60             | 6              |

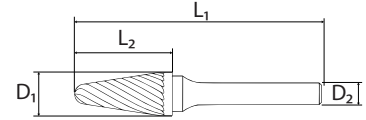










**BALL NOSED CONE**



|   |   |  |         |
|---|---|--|---------|
|  |  |  | Line    |
| <b>STANDARD</b>   | <b>STANDARD</b>   |  | Chamfer |
| DSF   | ALU   |  |         |

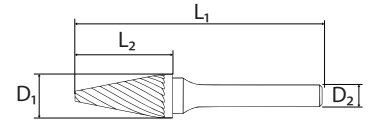
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|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-040-040 |                  | 3              | 13             | 38             | 3              |
| 0641-500-040-065 |                  | 6              | 16             | 60             | 6              |
| 0641-500-040-080 |                  | 8              | 20             | 45             | 6              |
| 0641-500-040-100 | 0641-500-040-510 | 10             | 25             | 50             | 6              |
| 0641-500-040-120 | 0641-500-040-512 | 12,7           | 32             | 65             | 6              |
| 0641-500-040-125 |                  | 12,7           | 32             | 70             | 8              |
| 0641-500-040-160 | 0641-500-040-516 | 16             | 33             | 70             | 6              |
| 0641-500-040-210 |                  | 10             | 25             | 175            | 6              |
| 0641-500-040-212 |                  | 12,7           | 32             | 180            | 6              |



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|---|---|--|---------|
|  |  |  | Line    |
| <b>PRO</b>  | <b>PRO</b>  |  | Chamfer |
| DSF   | DSF   |  | Coating |
|   | BLUE  |  |         |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-040-306 | 0641-500-040-406 | 6              | 16             | 50             | 6              |
| 0641-500-040-308 | 0641-500-040-408 | 8              | 20             | 45             | 6              |
| 0641-500-040-310 | 0641-500-040-410 | 10             | 25             | 50             | 6              |
| 0641-500-040-312 | 0641-500-040-412 | 12,7           | 32             | 65             | 6              |
| 0641-500-040-316 |                  | 16             | 33             | 70             | 6              |

**CONE**



|   |   |  |         |
|---|---|--|---------|
|  |  |  | Line    |
| <b>STANDARD</b>   | <b>STANDARD</b>   |  | Chamfer |
| DSF   | ALU   |  |         |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-045-030 |                  | 3              | 11             | 38             | 3              |
| 0641-500-045-065 |                  | 6              | 18             | 63             | 6              |
| 0641-500-045-080 |                  | 8              | 20             | 65             | 6              |
| 0641-500-045-100 | 0641-500-045-510 | 10             | 20             | 65             | 6              |
| 0641-500-045-120 | 0641-500-045-512 | 12,7           | 25             | 70             | 6              |
| 0641-500-045-125 |                  | 12,7           | 25             | 70             | 8              |
| 0641-500-045-160 |                  | 16             | 25             | 70             | 6              |
| 0641-500-045-212 |                  | 12,7           | 25             | 175            | 6              |

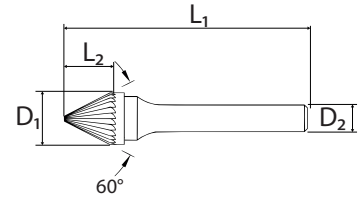
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|---|---|--|---------|
|  |  |  | Line    |
| <b>PRO</b>  | <b>PRO</b>  |  | Chamfer |
| DSF   | DSF   |  | Coating |
|   | BLUE  |  |         |

| CODE             |                  | D <sub>1</sub> | L <sub>2</sub> | L <sub>1</sub> | D <sub>2</sub> |
|------------------|------------------|----------------|----------------|----------------|----------------|
| 0641-500-045-306 | 0641-500-045-406 | 6              | 18             | 50             | 6              |
| 0641-500-045-308 |                  | 8              | 20             | 65             | 6              |
| 0641-500-045-310 | 0641-500-045-410 | 10             | 20             | 65             | 6              |
| 0641-500-045-312 | 0641-500-045-412 | 12,7           | 25             | 70             | 6              |
| 0641-500-045-316 |                  | 16             | 25             | 70             | 6              |



|                 |  |  |         |
|-----------------|--|--|---------|
| <b>STANDARD</b> |  |  | Line    |
| CS              |  |  | Chamfer |

**COUNTERSINK 60°**



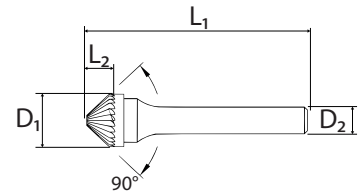
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|------------------|----------------|----------------|----------------|----------------|
| 0641-500-050-060 | 6              | 4              | 50             | 6              |
| 0641-500-050-100 | 10             | 8              | 50             | 6              |
| 0641-500-050-120 | 12,7           | 11             | 58             | 6              |
| 0641-500-050-160 | 16             | 14             | 61             | 6              |

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|-----------------|--|--|---------|
| <b>STANDARD</b> |  |  | Line    |
| CS              |  |  | Chamfer |

**COUNTERSINK 90°**



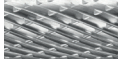
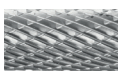


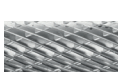
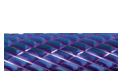
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|------------------|----------------|----------------|----------------|----------------|
| 0641-500-055-100 | 10             | 5              | 54             | 6              |
| 0641-500-055-120 | 12,7           | 6              | 55             | 6              |
| 0641-500-055-160 | 16             | 8              | 56             | 6              |
| 0641-500-055-190 | 19             | 10             | 57             | 6              |
| 0641-500-055-250 | 25             | 12             | 65             | 6              |

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|                    |                   | ALUMINIUM,<br>PLASTICS | BRASS, COPPER,<br>CAST IRON,<br>BRONZE | UNHARDENED STEEL     | HARDENED STEEL,<br>STAINLESS STEEL,<br>NIMONIC ALLOY |
|--------------------|-------------------|------------------------|--|----------------------|--|
| Cutter diameter    | Max working speed | Speed range            | Speed range                            | Speed range          | Speed range  |
| <b>3mm (1/8")</b>  | <b>100.000</b>    | <b>60.000-80.000</b>   | <b>45.000-80.000</b>                   | <b>60.000-80.000</b> | <b>60.000-80.000</b>                                 |
| <b>6mm (1/4")</b>  | <b>65.000</b>     | <b>15.000-60.000</b>   | <b>22.000-60.000</b>                   | <b>45.000-60.000</b> | <b>30.000-45.000</b>                                 |
| <b>10mm (3/8")</b> | <b>55.000</b>     | <b>10.000-50.000</b>   | <b>15.000-40.000</b>                   | <b>30.000-40.000</b> | <b>19.000-30.000</b>                                 |
| <b>12mm (1/2")</b> | <b>35.000</b>     | <b>7.000-30.000</b>    | <b>11.000-30.000</b>                   | <b>22.000-30.000</b> | <b>15.000-22.000</b>                                 |
| <b>16mm (5/8")</b> | <b>25.000</b>     | <b>6.000-20.000</b>    | <b>9.000-20.000</b>                    | <b>18.000-20.000</b> | <b>12.000-18.000</b>                                 |
| <b>20mm (3/4")</b> | <b>20.000</b>     | <b>5.000-17.000</b>    | <b>8.000-17.000</b>                    | <b>15.000-17.000</b> | <b>10.000-15.000</b>                                 |
| <b>25mm (1")</b>   | <b>15.000</b>     | <b>4.000-13.000</b>    | <b>6.000-13.000</b>                    | <b>10.000-13.000</b> | <b>7.000-11.000</b>                                  |

\* Extra long burrs (>150mm long) require slower speeds.

|               |   |   | 850 | 1200 | 1400 | 49HRC | INOX | GG | ALU | CU | TI | NI | PL |
|---------------|---|---|-----|------|------|-------|------|----|-----|----|----|----|----|
| Standard Line |    | For general application.  | DS  | ●    | ●    | ○     | ●    | ●  | ●   | ●  | ●  | ●  |    |
|               |    | For general application. The finer pitch eliminates vibration of the tool at insufficient rotation. | DSF | ●    | ●    | ○     | ●    | ●  |     | ●  | ●  | ●  |    |
|               |    | For processing of aluminium and plastic alloys. Thicker edges enable removal of chips.              | ALU |      |      |       |      |    | ●   |    |    |    | ●  |
|               |    | For general application. Smooth surface finish.   | CS  | ●    | ●    | ●     | ●    | ●  | ●   |    | ●  | ●  | ●  |
| Pro Line      |    | For general application.  | DSF | ●    | ●    | ●     | ●    | ●  |     | ●  | ●  | ●  |    |
|               |  | For general application. Blue coating extends significantly the tool's life.                        | DSF | ●    | ●    | ●     | ●    | ●  |     | ●  | ●  | ●  |    |

**Standard Line**  
 - Fine-grain carbide  
 - Excellent ratio of price to quality

**Pro Line**  
 - Ultra fine-grain carbide  
 - Higher durability  
 - Recommended for very hard materials

● - recommended ○ - acceptable



# ANNULAR CUTTERS TREPANNING DRILLS



HSS ANNULAR CUTTERS / TREPANNING DRILLS ..... 22



TCT ANNULAR CUTTERS / TREPANNING DRILLS ..... 24



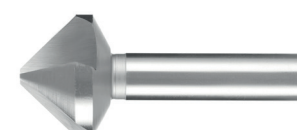
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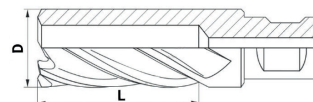


## HSS ANNULAR CUTTERS / TREPANNING DRILLS



WELDON  
SHANK  
19mm (3/4")

HSS

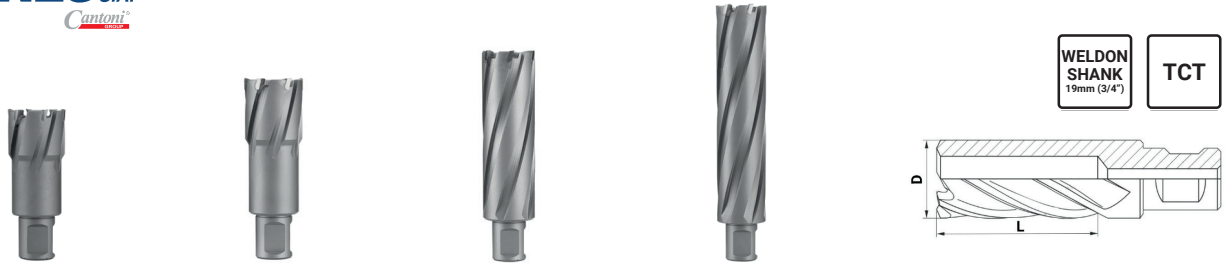


| STANDARD         | STANDARD         | STANDARD         | STANDARD         | Line           |
|------------------|------------------|------------------|------------------|----------------|
| HSS              | HSS              | HSS              | HSS              | Material       |
| 25mm             | 50mm             | 75mm             | 100mm            | Cutting length |
| 0641-231-050-300 | 0641-231-100-300 | 0641-231-124-300 | 0641-231-126-300 | Pilot pin      |

| CODE             |                  |                  |                  | D  | shank |
|------------------|------------------|------------------|------------------|----|-------|
| 0641-231-050-010 | 0641-231-100-010 |                  |                  | 12 | 19    |
| 0641-231-050-015 | 0641-231-100-015 |                  |                  | 13 | 19    |
| 0641-231-050-020 | 0641-231-100-020 |                  |                  | 14 | 19    |
| 0641-231-050-025 | 0641-231-100-025 |                  |                  | 15 | 19    |
| 0641-231-050-030 | 0641-231-100-030 |                  |                  | 16 | 19    |
| 0641-231-050-035 | 0641-231-100-035 |                  |                  | 17 | 19    |
| 0641-231-050-040 | 0641-231-100-040 | 0641-231-104-040 | 0641-231-106-040 | 18 | 19    |
| 0641-231-050-045 | 0641-231-100-045 | 0641-231-104-045 | 0641-231-106-045 | 19 | 19    |
| 0641-231-050-050 | 0641-231-100-050 | 0641-231-104-050 | 0641-231-106-050 | 20 | 19    |
| 0641-231-050-055 | 0641-231-100-055 | 0641-231-104-055 | 0641-231-106-055 | 21 | 19    |
| 0641-231-050-060 | 0641-231-100-060 | 0641-231-104-060 | 0641-231-106-060 | 22 | 19    |
| 0641-231-050-065 | 0641-231-100-065 | 0641-231-104-065 | 0641-231-106-065 | 23 | 19    |
| 0641-231-050-070 | 0641-231-100-070 | 0641-231-104-070 | 0641-231-106-070 | 24 | 19    |
| 0641-231-050-075 | 0641-231-100-075 | 0641-231-104-075 | 0641-231-106-075 | 25 | 19    |
| 0641-231-050-080 | 0641-231-100-080 | 0641-231-104-080 | 0641-231-106-080 | 26 | 19    |
| 0641-231-050-085 | 0641-231-100-085 | 0641-231-104-085 | 0641-231-106-085 | 27 | 19    |
| 0641-231-050-090 | 0641-231-100-090 | 0641-231-104-090 | 0641-231-106-090 | 28 | 19    |
| 0641-231-050-095 | 0641-231-100-095 | 0641-231-104-095 | 0641-231-106-095 | 29 | 19    |
| 0641-231-050-100 | 0641-231-100-100 | 0641-231-104-100 | 0641-231-106-100 | 30 | 19    |
| 0641-231-050-105 | 0641-231-100-105 | 0641-231-104-105 | 0641-231-106-105 | 31 | 19    |
| 0641-231-050-110 | 0641-231-100-110 | 0641-231-104-110 | 0641-231-106-110 | 32 | 19    |
| 0641-231-050-115 | 0641-231-100-115 | 0641-231-104-115 | 0641-231-106-115 | 33 | 19    |
| 0641-231-050-120 | 0641-231-100-120 | 0641-231-104-120 | 0641-231-106-120 | 34 | 19    |
| 0641-231-050-125 | 0641-231-100-125 | 0641-231-104-125 | 0641-231-106-125 | 35 | 19    |
| 0641-231-050-130 | 0641-231-100-130 | 0641-231-104-130 | 0641-231-106-130 | 36 | 19    |
| 0641-231-050-135 | 0641-231-100-135 | 0641-231-104-135 | 0641-231-106-135 | 37 | 19    |
| 0641-231-050-140 | 0641-231-100-140 | 0641-231-104-140 | 0641-231-106-140 | 38 | 19    |
| 0641-231-050-145 | 0641-231-100-145 | 0641-231-104-145 | 0641-231-106-145 | 39 | 19    |
| 0641-231-050-150 | 0641-231-100-150 | 0641-231-104-150 | 0641-231-106-150 | 40 | 19    |
| 0641-231-050-155 | 0641-231-100-155 | 0641-231-104-155 | 0641-231-106-155 | 41 | 19    |
| 0641-231-050-160 | 0641-231-100-160 | 0641-231-104-160 | 0641-231-106-160 | 42 | 19    |
| 0641-231-050-165 | 0641-231-100-165 | 0641-231-104-165 | 0641-231-106-165 | 43 | 19    |
| 0641-231-050-170 | 0641-231-100-170 | 0641-231-104-170 | 0641-231-106-170 | 44 | 19    |
| 0641-231-050-175 | 0641-231-100-175 | 0641-231-104-175 | 0641-231-106-175 | 45 | 19    |
| 0641-231-050-177 | 0641-231-100-180 | 0641-231-104-180 | 0641-231-106-180 | 46 | 19    |
| 0641-231-050-179 | 0641-231-100-182 | 0641-231-104-182 | 0641-231-106-182 | 47 | 19    |
| 0641-231-050-182 | 0641-231-100-184 | 0641-231-104-184 | 0641-231-106-184 | 48 | 19    |
| 0641-231-050-185 | 0641-231-100-186 | 0641-231-104-186 | 0641-231-106-186 | 49 | 19    |
| 0641-231-050-200 | 0641-231-100-200 | 0641-231-104-200 | 0641-231-106-200 | 50 | 19    |
| 0641-231-050-500 | 0641-231-100-500 | 0641-231-104-500 | 0641-231-106-500 | 51 | 19    |
| 0641-231-050-502 | 0641-231-100-502 | 0641-231-104-502 | 0641-231-106-502 | 52 | 19    |
| 0641-231-050-504 | 0641-231-100-504 | 0641-231-104-504 | 0641-231-106-504 | 53 | 19    |
| 0641-231-050-506 | 0641-231-100-506 | 0641-231-104-506 | 0641-231-106-506 | 54 | 19    |
| 0641-231-050-508 | 0641-231-100-508 | 0641-231-104-508 | 0641-231-106-508 | 55 | 19    |
| 0641-231-050-510 | 0641-231-100-510 | 0641-231-104-510 | 0641-231-106-510 | 56 | 19    |
| 0641-231-050-512 | 0641-231-100-512 | 0641-231-104-512 | 0641-231-106-512 | 57 | 19    |
| 0641-231-050-514 | 0641-231-100-514 | 0641-231-104-514 | 0641-231-106-514 | 58 | 19    |
| 0641-231-050-516 | 0641-231-100-516 | 0641-231-104-516 | 0641-231-106-516 | 59 | 19    |
| 0641-231-050-518 | 0641-231-100-518 | 0641-231-104-518 | 0641-231-106-518 | 60 | 19    |



## TCT ANNULAR CUTTERS / TREPANNING DRILLS



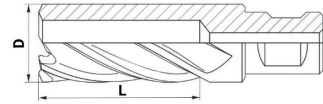
| STANDARD                       | STANDARD                       | STANDARD               | STANDARD               | Line           |       |
|--------------------------------|--------------------------------|------------------------|------------------------|----------------|-------|
| Tungsten carbide teeth         | Tungsten carbide teeth         | Tungsten carbide teeth | Tungsten carbide teeth | Material       |       |
| 35mm                           | 50mm                           | 75mm                   | 100mm                  | Cutting length |       |
| 0641-231-110-300<br>/D 12-16mm | 0641-231-100-300<br>/D 12-16mm | 0641-231-124-300       | 0641-231-126-300       | Pilot pin      |       |
| 0641-231-110-305<br>/od D 17mm | 0641-231-120-300<br>/od D 17mm |                        |                        |                |       |
| CODE                           |                                |                        |                        | D              | shank |
| 0641-231-110-010               | 0641-231-120-010               |                        |                        | 12             | 19    |
| 0641-231-110-015               | 0641-231-120-015               |                        |                        | 13             | 19    |
| 0641-231-110-020               | 0641-231-120-020               |                        |                        | 14             | 19    |
| 0641-231-110-025               | 0641-231-120-025               |                        |                        | 15             | 19    |
| 0641-231-110-030               | 0641-231-120-030               |                        |                        | 16             | 19    |
| 0641-231-110-035               | 0641-231-120-035               |                        |                        | 17             | 19    |
| 0641-231-110-040               | 0641-231-120-040               | 0641-231-124-040       | 0641-231-126-040       | 18             | 19    |
| 0641-231-110-045               | 0641-231-120-045               | 0641-231-124-045       | 0641-231-126-045       | 19             | 19    |
| 0641-231-110-050               | 0641-231-120-050               | 0641-231-124-050       | 0641-231-126-050       | 20             | 19    |
| 0641-231-110-055               | 0641-231-120-055               | 0641-231-124-055       | 0641-231-126-055       | 21             | 19    |
| 0641-231-110-060               | 0641-231-120-060               | 0641-231-124-060       | 0641-231-126-060       | 22             | 19    |
| 0641-231-110-065               | 0641-231-120-065               | 0641-231-124-065       | 0641-231-126-065       | 23             | 19    |
| 0641-231-110-070               | 0641-231-120-070               | 0641-231-124-070       | 0641-231-126-070       | 24             | 19    |
| 0641-231-110-075               | 0641-231-120-075               | 0641-231-124-075       | 0641-231-126-075       | 25             | 19    |
| 0641-231-110-080               | 0641-231-120-080               | 0641-231-124-080       | 0641-231-126-080       | 26             | 19    |
| 0641-231-110-085               | 0641-231-120-085               | 0641-231-124-085       | 0641-231-126-085       | 27             | 19    |
| 0641-231-110-090               | 0641-231-120-090               | 0641-231-124-090       | 0641-231-126-090       | 28             | 19    |
| 0641-231-110-095               | 0641-231-120-095               | 0641-231-124-095       | 0641-231-126-095       | 29             | 19    |
| 0641-231-110-100               | 0641-231-120-100               | 0641-231-124-100       | 0641-231-126-100       | 30             | 19    |
| 0641-231-110-105               | 0641-231-120-105               | 0641-231-124-105       | 0641-231-126-105       | 31             | 19    |
| 0641-231-110-110               | 0641-231-120-110               | 0641-231-124-110       | 0641-231-126-110       | 32             | 19    |
| 0641-231-110-115               | 0641-231-120-115               | 0641-231-124-115       | 0641-231-126-115       | 33             | 19    |
| 0641-231-110-120               | 0641-231-120-120               | 0641-231-124-120       | 0641-231-126-120       | 34             | 19    |
| 0641-231-110-125               | 0641-231-120-125               | 0641-231-124-125       | 0641-231-126-125       | 35             | 19    |
| 0641-231-110-130               | 0641-231-120-130               | 0641-231-124-130       | 0641-231-126-130       | 36             | 19    |
| 0641-231-110-135               | 0641-231-120-135               | 0641-231-124-135       | 0641-231-126-135       | 37             | 19    |
| 0641-231-110-140               | 0641-231-120-140               | 0641-231-124-140       | 0641-231-126-140       | 38             | 19    |
| 0641-231-110-145               | 0641-231-120-145               | 0641-231-124-145       | 0641-231-126-145       | 39             | 19    |
| 0641-231-110-150               | 0641-231-120-150               | 0641-231-124-150       | 0641-231-126-150       | 40             | 19    |
| 0641-231-110-155               | 0641-231-120-155               | 0641-231-124-155       | 0641-231-126-155       | 41             | 19    |
| 0641-231-110-160               | 0641-231-120-160               | 0641-231-124-160       | 0641-231-126-160       | 42             | 19    |
| 0641-231-110-165               | 0641-231-120-165               | 0641-231-124-165       | 0641-231-126-165       | 43             | 19    |
| 0641-231-110-170               | 0641-231-120-170               | 0641-231-124-170       | 0641-231-126-170       | 44             | 19    |
| 0641-231-110-175               | 0641-231-120-175               | 0641-231-124-175       | 0641-231-126-175       | 45             | 19    |
| 0641-231-110-180               | 0641-231-120-180               | 0641-231-124-180       | 0641-231-126-180       | 46             | 19    |
| 0641-231-110-185               | 0641-231-120-185               | 0641-231-124-185       | 0641-231-126-185       | 47             | 19    |
| 0641-231-110-190               | 0641-231-120-190               | 0641-231-124-190       | 0641-231-126-190       | 48             | 19    |
| 0641-231-110-195               | 0641-231-120-195               | 0641-231-124-195       | 0641-231-126-195       | 49             | 19    |
| 0641-231-110-200               | 0641-231-120-200               | 0641-231-124-200       | 0641-231-126-200       | 50             | 19    |
| 0641-231-110-500               | 0641-231-120-500               | 0641-231-124-500       | 0641-231-126-500       | 51             | 19    |
| 0641-231-110-502               | 0641-231-120-502               | 0641-231-124-502       | 0641-231-126-502       | 52             | 19    |
| 0641-231-110-504               | 0641-231-120-504               | 0641-231-124-504       | 0641-231-126-504       | 53             | 19    |
| 0641-231-110-506               | 0641-231-120-506               | 0641-231-124-506       | 0641-231-126-506       | 54             | 19    |
| 0641-231-110-508               | 0641-231-120-508               | 0641-231-124-508       | 0641-231-126-508       | 55             | 19    |
| 0641-231-110-510               | 0641-231-120-510               | 0641-231-124-510       | 0641-231-126-510       | 56             | 19    |
| 0641-231-110-512               | 0641-231-120-512               | 0641-231-124-512       | 0641-231-126-512       | 57             | 19    |
| 0641-231-110-514               | 0641-231-120-514               | 0641-231-124-514       | 0641-231-126-514       | 58             | 19    |
| 0641-231-110-516               | 0641-231-120-516               | 0641-231-124-516       | 0641-231-126-516       | 59             | 19    |
| 0641-231-110-518               | 0641-231-120-518               | 0641-231-124-518       | 0641-231-126-518       | 60             | 19    |

## TCT ANNULAR CUTTERS / TREPANNING DRILLS



WELDON  
SHANK  
32mm (1.1/4")

TCT



| STANDARD               | STANDARD               | STANDARD               | STANDARD               | Line           |       |
|------------------------|------------------------|------------------------|------------------------|----------------|-------|
| Tungsten carbide teeth | Tungsten carbide teeth | Tungsten carbide teeth | Tungsten carbide teeth | Material       |       |
| 35mm                   | 50mm                   | 75mm                   | 100mm                  | Cutting length |       |
| 0641-231-120-300       | 0641-231-124-300       | 0641-231-124-305       | 0641-231-126-305       | Pilot pin      |       |
| CODE                   |                        |                        |                        | D              | shank |
| 0641-231-110-520       | 0641-231-120-520       | 0641-231-124-520       | 0641-231-126-520       | 61             | 32    |
| 0641-231-110-522       | 0641-231-120-522       | 0641-231-124-522       | 0641-231-126-522       | 62             | 32    |
| 0641-231-110-524       | 0641-231-120-524       | 0641-231-124-524       | 0641-231-126-524       | 63             | 32    |
| 0641-231-110-536       | 0641-231-120-526       | 0641-231-124-526       | 0641-231-126-526       | 64             | 32    |
| 0641-231-110-538       | 0641-231-120-528       | 0641-231-124-528       | 0641-231-126-528       | 65             | 32    |
|                        | 0641-231-120-530       | 0641-231-124-530       | 0641-231-126-530       | 66             | 32    |
|                        | 0641-231-120-532       | 0641-231-124-532       | 0641-231-126-532       | 67             | 32    |
|                        | 0641-231-120-534       | 0641-231-124-534       | 0641-231-126-534       | 68             | 32    |
|                        | 0641-231-120-536       | 0641-231-124-536       | 0641-231-126-536       | 69             | 32    |
|                        | 0641-231-120-538       | 0641-231-124-538       | 0641-231-126-538       | 70             | 32    |
|                        | 0641-231-120-540       | 0641-231-124-540       | 0641-231-126-540       | 71             | 32    |
|                        | 0641-231-120-542       | 0641-231-124-542       | 0641-231-126-542       | 72             | 32    |
|                        | 0641-231-120-544       | 0641-231-124-544       | 0641-231-126-544       | 73             | 32    |
|                        | 0641-231-120-546       | 0641-231-124-546       | 0641-231-126-546       | 74             | 32    |
|                        | 0641-231-120-548       | 0641-231-124-548       | 0641-231-126-548       | 75             | 32    |
|                        | 0641-231-120-550       | 0641-231-124-550       | 0641-231-126-550       | 76             | 32    |
|                        | 0641-231-120-552       | 0641-231-124-552       | 0641-231-126-552       | 77             | 32    |
|                        | 0641-231-120-554       | 0641-231-124-554       | 0641-231-126-554       | 78             | 32    |
|                        | 0641-231-120-556       | 0641-231-124-556       | 0641-231-126-556       | 79             | 32    |
|                        | 0641-231-120-558       | 0641-231-124-558       | 0641-231-126-558       | 80             | 32    |
|                        | 0641-231-120-560       | 0641-231-124-560       | 0641-231-126-560       | 81             | 32    |
|                        | 0641-231-120-562       | 0641-231-124-562       | 0641-231-126-562       | 82             | 32    |
|                        | 0641-231-120-564       | 0641-231-124-564       | 0641-231-126-564       | 83             | 32    |
|                        | 0641-231-120-566       | 0641-231-124-566       | 0641-231-126-566       | 84             | 32    |
|                        | 0641-231-120-568       | 0641-231-124-568       | 0641-231-126-568       | 85             | 32    |
|                        | 0641-231-120-570       | 0641-231-124-570       | 0641-231-126-570       | 86             | 32    |
|                        | 0641-231-120-572       | 0641-231-124-572       | 0641-231-126-572       | 87             | 32    |
|                        | 0641-231-120-574       | 0641-231-124-574       | 0641-231-126-574       | 88             | 32    |
|                        | 0641-231-120-576       | 0641-231-124-576       | 0641-231-126-576       | 89             | 32    |
|                        | 0641-231-120-578       | 0641-231-124-578       | 0641-231-126-578       | 90             | 32    |
|                        | 0641-231-120-580       | 0641-231-124-580       | 0641-231-126-580       | 91             | 32    |
|                        | 0641-231-120-582       | 0641-231-124-582       | 0641-231-126-582       | 92             | 32    |
|                        | 0641-231-120-584       | 0641-231-124-584       | 0641-231-126-584       | 93             | 32    |
|                        | 0641-231-120-586       | 0641-231-124-586       | 0641-231-126-586       | 94             | 32    |
|                        | 0641-231-120-588       | 0641-231-124-588       | 0641-231-126-588       | 95             | 32    |
|                        | 0641-231-120-590       | 0641-231-124-590       | 0641-231-126-590       | 96             | 32    |
|                        | 0641-231-120-592       | 0641-231-124-592       | 0641-231-126-592       | 97             | 32    |
|                        | 0641-231-120-594       | 0641-231-124-594       | 0641-231-126-594       | 98             | 32    |
|                        | 0641-231-120-596       | 0641-231-124-596       | 0641-231-126-596       | 99             | 32    |
|                        | 0641-231-120-598       | 0641-231-124-598       | 0641-231-126-598       | 100            | 32    |
|                        | 0641-231-120-602       | 0641-231-124-602       | 0641-231-126-602       | 102            | 32    |
|                        | 0641-231-120-610       | 0641-231-124-610       | 0641-231-126-610       | 105            | 32    |
|                        | 0641-231-120-620       | 0641-231-124-620       | 0641-231-126-620       | 110            | 32    |
|                        | 0641-231-120-624       | 0641-231-124-624       | 0641-231-126-624       | 112            | 32    |
|                        | 0641-231-120-630       | 0641-231-124-630       | 0641-231-126-630       | 115            | 32    |
|                        | 0641-231-120-640       | 0641-231-124-640       | 0641-231-126-640       | 120            | 32    |





| PILOT PINS       |                |              |
|------------------|----------------|--------------|
| CODE             | diameter<br>mm | length<br>mm |
| 0641-231-050-300 | 6,34           | 77           |
| 0641-231-110-300 | 6,34           | 90           |
| 0641-231-100-300 | 6,34           | 103          |
| 0641-231-100-305 | 7,98           | 77           |
| 0641-231-110-305 | 7,98           | 90           |
| 0641-231-120-300 | 7,98           | 103          |
| 0641-231-124-300 | 7,98           | 130          |
| 0641-231-124-305 | 7,98           | 155          |
| 0641-231-126-300 | 7,98           | 165          |
| 0641-231-126-305 | 7,98           | 190          |



| ADAPTER MK/WELDON |                                  |                         |
|-------------------|----------------------------------|-------------------------|
| CODE              | outside connection<br>Morse cone | inside connection<br>mm |
| 0641-231-120-310  | MK2                              | Weldon 19               |
| 0641-231-120-320  | MK3                              | Weldon 19               |
| 0641-231-120-325  | MK3                              | Weldon 32               |
|                   |                                  |                         |
|                   |                                  |                         |



| ADAPTER QUICK-IN/WELDON |                          |                         |
|-------------------------|--------------------------|-------------------------|
| CODE                    | outside connection<br>mm | inside connection<br>mm |
| 0641-231-120-340        | Quick-in 18              | Weldon 19               |
|                         |                          |                         |
|                         |                          |                         |
|                         |                          |                         |



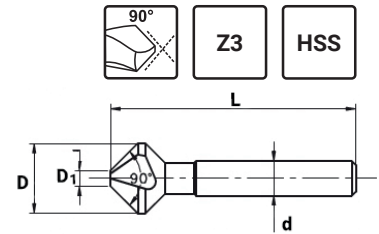
| ADAPTER WELDON 19 / WELDON 32 |                          |                         |
|-------------------------------|--------------------------|-------------------------|
| CODE                          | outside connection<br>mm | inside connection<br>mm |
| 0641-231-120-340              | Weldon 19                | Weldon 32               |
|                               |                          |                         |
|                               |                          |                         |
|                               |                          |                         |



| EXTENSION        |                                 |              |
|------------------|---------------------------------|--------------|
| CODE             | outside/inside connection<br>mm | length<br>mm |
| 0641-231-120-342 | Weldon 19                       | 50           |
| 0641-231-120-344 | Weldon 19                       | 75           |
| 0641-231-120-346 | Weldon 19                       | 100          |
|                  |                                 |              |
|                  |                                 |              |

### COUNTERSINKS DIN 335-C

|          |          |          |      |          |
|----------|----------|----------|------|----------|
| STANDARD | STANDARD | STANDARD | PRO  | Line     |
| HSS      | HSS      | HSSE     | HSSE | Material |
| 3        | 3        | 3        | 3    | Flutes   |
|          | TIN      |          | Blue | Coating  |

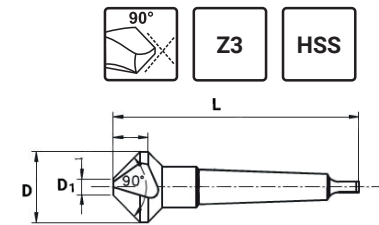


| CODE             |                  |                  |                  | D    | D <sub>1</sub> | d  | L  |
|------------------|------------------|------------------|------------------|------|----------------|----|----|
| 0640-431-000-063 | 0640-431-020-063 | 0640-431-100-063 | 0640-431-170-063 | 6,3  | 1,5            | 5  | 45 |
| 0640-431-000-083 | 0640-431-020-083 | 0640-431-100-083 | 0640-431-170-083 | 8,3  | 2              | 6  | 50 |
| 0640-431-000-104 | 0640-431-020-104 | 0640-431-100-104 | 0640-431-170-104 | 10,4 | 2,5            | 6  | 50 |
| 0640-431-000-125 | 0640-431-020-125 | 0640-431-100-125 | 0640-431-170-125 | 12,4 | 2,8            | 8  | 56 |
| 0640-431-000-165 | 0640-431-020-165 | 0640-431-100-165 | 0640-431-170-165 | 16,5 | 3,2            | 10 | 60 |
| 0640-431-000-205 | 0640-431-020-205 | 0640-431-100-205 | 0640-431-170-205 | 20,5 | 3,5            | 10 | 63 |
| 0640-431-000-250 | 0640-431-020-250 | 0640-431-100-250 | 0640-431-170-250 | 25   | 3,8            | 10 | 67 |
| 0640-431-000-310 | 0640-431-020-310 | 0640-431-100-310 | 0640-431-170-310 | 31   | 4,2            | 12 | 71 |
| 0640-431-000-400 | 0640-431-020-400 |                  |                  | 40   | 7              | 13 | 80 |



### COUNTERSINKS DIN 335-D

|          |  |  |  |          |
|----------|--|--|--|----------|
| STANDARD |  |  |  | Line     |
| HSS      |  |  |  | Material |
| 3        |  |  |  | Flutes   |



| CODE             |  |  |  | D    | D <sub>1</sub> | L   | MK |
|------------------|--|--|--|------|----------------|-----|----|
| 0640-431-120-165 |  |  |  | 16,5 | 3              | 85  | 1  |
| 0640-431-120-205 |  |  |  | 20,5 | 3              | 100 | 2  |
| 0640-431-120-250 |  |  |  | 25   | 3              | 103 | 2  |
| 0640-431-120-310 |  |  |  | 31   | 3,5            | 112 | 2  |
| 0640-431-120-340 |  |  |  | 34   | 3,5            | 118 | 2  |
| 0640-431-120-370 |  |  |  | 37   | 4              | 118 | 2  |
| 0640-431-120-400 |  |  |  | 40   | 8              | 140 | 3  |
| 0640-431-120-500 |  |  |  | 50   | 12             | 150 | 3  |
| 0640-431-120-630 |  |  |  | 63   | 15             | 180 | 4  |
| 0640-431-120-800 |  |  |  | 80   | 22             | 190 | 4  |

## CUTTING PARAMETERS FOR TREPANNING DRILLS

| MATERIAL    | CARBON STEEL |             | ALLOY STEEL |             | CAST IRON   |             | ALUMINIUM   |             |
|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| DRILL TYPE  | HSS          | TCT         | HSS         | TCT         | HSS         | TCT         | HSS         | TCT         |
| SPEED (m/s) | 27           | 45          | 18          | 32          | 9           | 36          | 27          | 36          |
| SIZE [mm]   | obr. / min.  | obr. / min. | obr. / min. | obr. / min. | obr. / min. | obr. / min. | obr. / min. | obr. / min. |
| 12          | 716          | 1194        | 477         | 848         | 239         | 954         | 716         | 1274        |
| 13          | 661          | 1102        | 441         | 783         | 220         | 881         | 661         | 1176        |
| 14          | 614          | 1023        | 409         | 727         | 205         | 818         | 614         | 1092        |
| 15          | 573          | 955         | 382         | 679         | 191         | 763         | 573         | 1019        |
| 16          | 537          | 895         | 358         | 636         | 179         | 716         | 537         | 955         |
| 17          | 506          | 843         | 337         | 599         | 169         | 674         | 506         | 899         |
| 18          | 477          | 796         | 318         | 565         | 159         | 636         | 477         | 849         |
| 19          | 452          | 754         | 302         | 536         | 151         | 603         | 452         | 805         |
| 20          | 430          | 716         | 286         | 509         | 143         | 572         | 430         | 764         |
| 21          | 409          | 682         | 273         | 485         | 136         | 545         | 409         | 728         |
| 22          | 391          | 651         | 260         | 462         | 130         | 520         | 391         | 695         |
| 23          | 374          | 623         | 249         | 442         | 125         | 498         | 374         | 665         |
| 24          | 358          | 597         | 239         | 424         | 119         | 477         | 358         | 637         |
| 25          | 344          | 573         | 229         | 407         | 115         | 458         | 344         | 611         |
| 26          | 331          | 551         | 220         | 391         | 110         | 440         | 331         | 588         |
| 27          | 318          | 531         | 212         | 377         | 106         | 424         | 318         | 566         |
| 28          | 307          | 512         | 205         | 363         | 102         | 409         | 307         | 546         |
| 29          | 296          | 494         | 198         | 351         | 99          | 395         | 296         | 527         |
| 30          | 286          | 477         | 191         | 339         | 96          | 381         | 286         | 510         |
| 31          | 277          | 462         | 185         | 328         | 92          | 369         | 277         | 493         |
| 32          | 269          | 448         | 179         | 318         | 90          | 358         | 269         | 478         |
| 33          | 260          | 434         | 174         | 308         | 87          | 347         | 260         | 463         |
| 34          | 253          | 421         | 169         | 299         | 84          | 337         | 253         | 450         |
| 35          | 246          | 409         | 164         | 291         | 82          | 327         | 246         | 437         |
| 36          | 239          | 398         | 159         | 282         | 80          | 318         | 239         | 425         |
| 37          | 232          | 387         | 155         | 275         | 77          | 309         | 232         | 413         |
| 38          | 226          | 377         | 151         | 268         | 75          | 301         | 226         | 402         |
| 39          | 220          | 367         | 147         | 261         | 73          | 293         | 220         | 392         |
| 40          | 215          | 358         | 143         | 254         | 72          | 286         | 215         | 382         |
| 41          | 210          | 349         | 140         | 248         | 70          | 279         | 210         | 373         |
| 42          | 205          | 341         | 136         | 242         | 68          | 272         | 205         | 364         |
| 43          | 200          | 333         | 133         | 236         | 67          | 266         | 200         | 356         |
| 44          | 195          | 326         | 130         | 231         | 65          | 260         | 195         | 347         |
| 45          | 191          | 318         | 127         | 226         | 64          | 254         | 191         | 340         |
| 46          | 187          | 311         | 125         | 221         | 62          | 249         | 187         | 332         |
| 47          | 183          | 305         | 122         | 216         | 61          | 243         | 183         | 325         |
| 48          | 179          | 298         | 119         | 212         | 60          | 238         | 179         | 318         |
| 49          | 175          | 292         | 117         | 207         | 58          | 233         | 175         | 312         |
| 50          | 172          | 286         | 115         | 203         | 57          | 229         | 172         | 306         |
| 51          | 169          | 281         | 112         | 199         | 56          | 224         | 169         | 300         |
| 52          | 165          | 275         | 110         | 195         | 55          | 220         | 165         | 294         |
| 53          | 162          | 270         | 108         | 192         | 54          | 216         | 162         | 288         |
| 54          | 159          | 265         | 106         | 188         | 53          | 212         | 159         | 283         |
| 55          | 156          | 260         | 104         | 185         | 52          | 208         | 156         | 278         |
| 60          | 143          | 239         | 95          | 169         | 48          | 190         | 143         | 255         |
| 61          | 141          | 235         | 94          | 166         | 47          | 187         | 141         | 251         |
| 65          | 132          | 220         | 88          | 156         | 44          | 176         | 132         | 235         |
| 68          | 126          | 211         | 84          | 149         | 42          | 168         | 126         | 225         |
| 70          | 123          | 205         | 82          | 145         | 41          | 163         | 123         | 218         |
| 71          | 121          | 202         | 81          | 143         | 40          | 161         | 121         | 215         |
| 75          | 115          | 191         | 76          | 135         | 38          | 152         | 115         | 204         |
| 80          | 107          | 179         | 72          | 127         | 36          | 143         | 107         | 191         |
| 85          | 101          | 169         | 67          | 119         | 34          | 134         | 101         | 180         |
| 90          | 95           | 159         | 64          | 113         | 32          | 127         | 95          | 170         |
| 95          | 90           | 151         | 60          | 107         | 30          | 120         | 90          | 161         |
| 100         | 86           | 143         | 57          | 101         | 29          | 114         | 86          | 153         |
| 110         | 78           | 130         | 52          | 92          | 26          | 104         | 78          | 139         |
| 120         | 72           | 119         | 48          | 84          | 24          | 95          | 72          | 127         |
| 130         | 66           | 110         | 44          | 78          | 22          | 88          | 66          | 118         |
| 140         | 61           | 102         | 41          | 72          | 20          | 81          | 61          | 109         |
| 150         | 57           | 95          | 38          | 67          | 19          | 76          | 57          | 102         |



# VHM END MILLS AND DRILLS



**VHM END MILLS for general applications** ..... 32



**GOLD VHM END MILLS for hardened materials** ..... 36



**BLUE VHM END MILLS for very hard materials** ..... 38



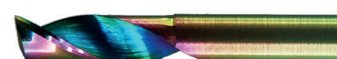
**INOX VHM END MILLS for stainless steel** ..... 40



**ALU VHM END MILLS for aluminium** ..... 41



**PVC VHM END MILLS for aluminium and PVC** ..... 42



**VHM END MILLS for aluminium and PVC windows frames** ..... 43



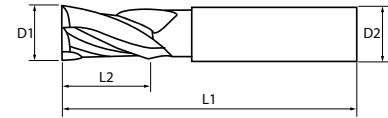
**VHM DRILLS** ..... 44







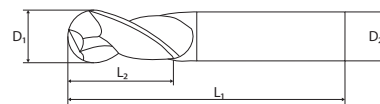
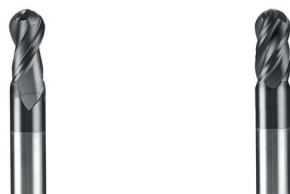
### VHM END MILLS for general applications



| GENERAL | GENERAL |  | Line         |
|---------|---------|--|--------------|
| 2       | 4       |  | Flutes       |
| ≤ 45    | ≤ 45    |  | Hardness HRC |
| square  | square  |  | Shape        |
|         |         |  |              |
|         |         |  |              |

| CODE             |                  | D1     | L2     | L1     | D2    |
|------------------|------------------|--------|--------|--------|-------|
| 0640-232-045-010 | 0640-234-045-010 | 1/32"  | 1/8"   | 1-1/2" | 1/8"  |
| 0640-232-045-020 | 0640-234-045-020 | 3/64"  | 1/8"   | 1-1/2" | 1/8"  |
| 0640-232-045-030 | 0640-234-045-030 | 1/16"  | 3/16"  | 1-1/2" | 1/8"  |
| 0640-232-045-040 | 0640-234-045-040 | 5/64"  | 1/4"   | 1-1/2" | 1/8"  |
| 0640-232-045-050 | 0640-234-045-050 | 3/32"  | 3/8"   | 1-1/2" | 1/8"  |
| 0640-232-045-060 | 0640-234-045-060 | 7/64"  | 3/8"   | 1-1/2" | 1/8"  |
| 0640-232-045-070 | 0640-234-045-070 | 1/8"   | 1/2"   | 1-1/2" | 1/8"  |
| 0640-232-045-080 | 0640-234-045-080 | 9/64"  | 9/16"  | 2"     | 3/16" |
| 0640-232-045-090 | 0640-234-045-090 | 5/32"  | 9/16"  | 2"     | 3/16" |
| 0640-232-045-100 | 0640-234-045-100 | 11/64" | 5/8"   | 2"     | 3/16" |
| 0640-232-045-110 | 0640-234-045-110 | 3/16"  | 5/8"   | 2"     | 3/16" |
| 0640-232-045-120 | 0640-234-045-120 | 13/64" | 5/8"   | 2-1/2" | 1/4"  |
| 0640-232-045-130 | 0640-234-045-130 | 7/32"  | 5/8"   | 2-1/2" | 1/4"  |
| 0640-232-045-140 | 0640-234-045-140 | 15/64" | 3/4"   | 2-1/2" | 1/4"  |
| 0640-232-045-150 | 0640-234-045-150 | 1/4"   | 3/4"   | 2-1/2" | 1/4"  |
| 0640-232-045-160 | 0640-234-045-160 | 17/64" | 3/4"   | 2-1/2" | 5/16" |
| 0640-232-045-170 | 0640-234-045-170 | 9/32"  | 3/4"   | 2-1/2" | 5/16" |
| 0640-232-045-180 | 0640-234-045-180 | 19/64" | 13/16" | 2-1/2" | 5/16" |
| 0640-232-045-190 | 0640-234-045-190 | 5/16"  | 13/16" | 2-1/2" | 5/16" |
| 0640-232-045-200 | 0640-234-045-200 | 11/32" | 1"     | 2-1/2" | 3/8"  |
| 0640-232-045-210 | 0640-234-045-210 | 3/8"   | 1"     | 2-1/2" | 3/8"  |
| 0640-232-045-220 | 0640-234-045-220 | 1/2"   | 1"     | 3"     | 1/2"  |
| 0640-232-045-230 | 0640-234-045-230 | 5/8"   | 1-1/4" | 3-1/2" | 5/8"  |
| 0640-232-045-240 | 0640-234-045-240 | 11/16" | 1-3/8" | 4"     | 3/4"  |
| 0640-232-045-250 | 0640-234-045-250 | 3/4"   | 1-1/2" | 4"     | 3/4"  |
| 0640-232-045-260 | 0640-234-045-260 | 1"     | 1-1/2" | 4"     | 1"    |
| 0640-232-045-270 | 0640-234-045-270 | 1/8"   | 1"     | 3"     | 1/8"  |
| 0640-232-045-280 | 0640-234-045-280 | 3/16"  | 1-1/8" | 3"     | 3/16" |
| 0640-232-045-290 | 0640-234-045-290 | 1/4"   | 1-1/8" | 3"     | 1/4"  |
| 0640-232-045-300 | 0640-234-045-300 | 1/4"   | 1-1/2" | 4"     | 1/4"  |
| 0640-232-045-310 | 0640-234-045-310 | 5/16"  | 1-1/8" | 3"     | 5/16" |
| 0640-232-045-320 | 0640-234-045-320 | 5/16"  | 1-5/8" | 4"     | 5/16" |
| 0640-232-045-330 | 0640-234-045-330 | 3/8"   | 1-1/8" | 3"     | 3/8"  |
| 0640-232-045-340 | 0640-234-045-340 | 3/8"   | 1-3/4" | 4"     | 3/8"  |
| 0640-232-045-350 | 0640-234-045-350 | 1/2"   | 2"     | 4"     | 1/2"  |
| 0640-232-045-360 | 0640-234-045-360 | 1/2"   | 3"     | 6"     | 1/2"  |
| 0640-232-045-370 | 0640-234-045-370 | 1/2"   | 1-1/2" | 6"     | 1/2"  |
| 0640-232-045-380 | 0640-234-045-380 | 5/8"   | 2-1/4" | 5"     | 5/8"  |
| 0640-232-045-390 | 0640-234-045-390 | 5/8"   | 3"     | 6"     | 5/8"  |
| 0640-232-045-400 | 0640-234-045-400 | 3/4"   | 2-1/4" | 5"     | 3/4"  |
| 0640-232-045-410 | 0640-234-045-410 | 3/4"   | 3"     | 6"     | 3/4"  |
| 0640-232-045-420 | 0640-234-045-420 | 1"     | 3"     | 6"     | 1"    |
|                  |                  |        |        |        |       |
|                  |                  |        |        |        |       |
|                  |                  |        |        |        |       |

## VHM END MILLS for general applications

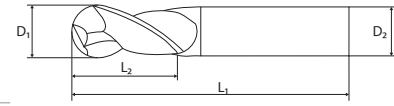


| GENERAL | GENERAL |  | Line         |
|---------|---------|--|--------------|
| 2       | 2       |  | Flutes       |
| ≤ 45    | ≤ 45    |  | Hardness HRC |
| ball    | ball    |  | Shape        |
|         |         |  |              |
|         |         |  |              |

| CODE             |                  | D1     | L2     | L1     | D2    |
|------------------|------------------|--------|--------|--------|-------|
| 0640-232-145-010 | 0640-234-145-010 | 1/32"  | 1/8"   | 1-1/2" | 1/8"  |
| 0640-232-145-020 | 0640-234-145-020 | 3/64"  | 1/8"   | 1-1/2" | 1/8"  |
| 0640-232-145-030 | 0640-234-145-030 | 1/16"  | 3/16"  | 1-1/2" | 1/8"  |
| 0640-232-145-040 | 0640-234-145-040 | 5/64"  | 1/4"   | 1-1/2" | 1/8"  |
| 0640-232-145-050 | 0640-234-145-050 | 3/32"  | 3/8"   | 1-1/2" | 1/8"  |
| 0640-232-145-060 | 0640-234-145-060 | 7/64"  | 3/8"   | 1-1/2" | 1/8"  |
| 0640-232-145-070 | 0640-234-145-070 | 1/8"   | 1/2"   | 1-1/2" | 1/8"  |
| 0640-232-145-080 | 0640-234-145-080 | 9/64"  | 9/16"  | 2"     | 3/16" |
| 0640-232-145-090 | 0640-234-145-090 | 5/32"  | 9/16"  | 2"     | 3/16" |
| 0640-232-145-100 | 0640-234-145-100 | 11/64" | 5/8"   | 2"     | 3/16" |
| 0640-232-145-110 | 0640-234-145-110 | 3/16"  | 5/8"   | 2"     | 3/16" |
| 0640-232-145-120 | 0640-234-145-120 | 13/64" | 5/8"   | 2-1/2" | 1/4"  |
| 0640-232-145-130 | 0640-234-145-130 | 7/32"  | 5/8"   | 2-1/2" | 1/4"  |
| 0640-232-145-140 | 0640-234-145-140 | 15/64" | 3/4"   | 2-1/2" | 1/4"  |
| 0640-232-145-150 | 0640-234-145-150 | 1/4"   | 3/4"   | 2-1/2" | 1/4"  |
| 0640-232-145-160 | 0640-234-145-160 | 17/64" | 3/4"   | 2-1/2" | 5/16" |
| 0640-232-145-170 | 0640-234-145-170 | 9/32"  | 3/4"   | 2-1/2" | 5/16" |
| 0640-232-145-180 | 0640-234-145-180 | 19/64" | 13/16" | 2-1/2" | 5/16" |
| 0640-232-145-190 | 0640-234-145-190 | 5/16"  | 13/16" | 2-1/2" | 5/16" |
| 0640-232-145-200 | 0640-234-145-200 | 11/32" | 1"     | 2-1/2" | 3/8"  |
| 0640-232-145-210 | 0640-234-145-210 | 3/8"   | 1"     | 2-1/2" | 3/8"  |
| 0640-232-145-220 | 0640-234-145-220 | 1/2"   | 1"     | 3"     | 1/2"  |
| 0640-232-145-230 | 0640-234-145-230 | 5/8"   | 1-1/4" | 3-1/2" | 5/8"  |
| 0640-232-145-240 | 0640-234-145-240 | 11/16" | 1-3/8" | 4"     | 3/4"  |
| 0640-232-145-250 | 0640-234-145-250 | 3/4"   | 1-1/2" | 4"     | 3/4"  |
| 0640-232-145-260 | 0640-234-145-260 | 1"     | 1-1/2" | 4"     | 1"    |
| 0640-232-145-270 | 0640-234-145-270 | 1/8"   | 1"     | 3"     | 1/8"  |
| 0640-232-145-280 | 0640-234-145-280 | 3/16"  | 1-1/8" | 3"     | 3/16" |
| 0640-232-145-290 | 0640-234-145-290 | 1/4"   | 1-1/8" | 3"     | 1/4"  |
| 0640-232-145-300 | 0640-234-145-300 | 1/4"   | 1-1/2" | 4"     | 1/4"  |
| 0640-232-145-310 | 0640-234-145-310 | 5/16"  | 1-1/8" | 3"     | 5/16" |
| 0640-232-145-320 | 0640-234-145-320 | 5/16"  | 1-5/8" | 4"     | 5/16" |
| 0640-232-145-330 | 0640-234-145-330 | 3/8"   | 1-1/8" | 3"     | 3/8"  |
| 0640-232-145-340 | 0640-234-145-340 | 3/8"   | 1-3/4" | 4"     | 3/8"  |
| 0640-232-145-350 | 0640-234-145-350 | 1/2"   | 2"     | 4"     | 1/2"  |
| 0640-232-145-360 | 0640-234-145-360 | 1/2"   | 3"     | 6"     | 1/2"  |
| 0640-232-145-370 | 0640-234-145-370 | 1/2"   | 1-1/2" | 6"     | 1/2"  |
| 0640-232-145-380 | 0640-234-145-380 | 5/8"   | 2-1/4" | 5"     | 5/8"  |
| 0640-232-145-390 | 0640-234-145-390 | 5/8"   | 3"     | 6"     | 5/8"  |
| 0640-232-145-400 | 0640-234-145-400 | 3/4"   | 2-1/4" | 5"     | 3/4"  |
| 0640-232-145-410 | 0640-234-145-410 | 3/4"   | 3"     | 6"     | 3/4"  |
| 0640-232-145-420 | 0640-234-145-420 | 1"     | 3"     | 6"     | 1"    |
|                  |                  |        |        |        |       |
|                  |                  |        |        |        |       |
|                  |                  |        |        |        |       |



### GOLD VHM END MILLS for hardened materials



| GOLD | GOLD | GOLD          | Line         |
|------|------|---------------|--------------|
| 2    | 4    | 4             | Flutes       |
| ≤ 55 | ≤ 55 | ≤ 55          | Hardness HRC |
| ball | ball | corner radius | Shape        |

| CODE             |                  | D1 | R   | L2 | L1  | D2 |
|------------------|------------------|----|-----|----|-----|----|
| 0640-232-150-020 | 0640-234-150-020 | 2  | 1   | 5  | 50  | 4  |
| 0640-232-150-030 | 0640-234-150-030 | 3  | 1,5 | 8  | 50  | 3  |
| 0640-232-150-040 | 0640-234-150-040 | 4  | 2   | 10 | 50  | 4  |
| 0640-232-150-050 | 0640-234-150-050 | 5  | 2,5 | 13 | 50  | 5  |
| 0640-232-150-060 | 0640-234-150-060 | 6  | 3   | 15 | 50  | 6  |
| 0640-232-150-080 | 0640-234-150-080 | 8  | 4   | 20 | 60  | 8  |
| 0640-232-150-100 | 0640-234-150-100 | 10 | 5   | 25 | 75  | 10 |
| 0640-232-150-120 | 0640-234-150-120 | 12 | 6   | 30 | 75  | 12 |
| 0640-232-150-140 | 0640-234-150-140 | 14 | 7   | 45 | 100 | 14 |
| 0640-232-150-160 | 0640-234-150-160 | 16 | 8   | 45 | 100 | 16 |
| 0640-232-150-180 | 0640-234-150-180 | 18 | 9   | 45 | 100 | 18 |
| 0640-232-150-200 | 0640-234-150-200 | 20 | 10  | 45 | 100 | 20 |
|                  | 0640-234-050-031 | 3  | 0,5 | 8  | 50  | 3  |
|                  | 0640-234-050-041 | 4  | 0,5 | 10 | 50  | 4  |
|                  | 0640-234-050-051 | 5  | 0,5 | 13 | 50  | 5  |
|                  | 0640-234-050-061 | 6  | 0,5 | 15 | 50  | 6  |
|                  | 0640-234-050-062 | 6  | 1   | 15 | 50  | 6  |
|                  | 0640-234-050-081 | 8  | 0,5 | 20 | 60  | 8  |
|                  | 0640-234-050-082 | 8  | 1   | 20 | 60  | 8  |
|                  | 0640-234-050-101 | 10 | 0,5 | 25 | 75  | 10 |
|                  | 0640-234-050-102 | 10 | 1   | 25 | 75  | 10 |
|                  | 0640-234-050-121 | 12 | 0,5 | 30 | 75  | 12 |
|                  | 0640-234-050-122 | 12 | 1   | 30 | 75  | 12 |







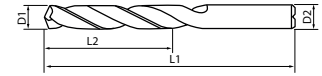








**VHM DRILLS**



|             |                  |  |  |                  |
|-------------|------------------|--|--|------------------|
| <b>GOLD</b> | <b>GOLD</b>      |  |  | Line             |
| 2           | 2                |  |  | Flutes           |
| ≤ 55        | ≤ 55             |  |  | Hardness HRC     |
|             | Internal cooling |  |  | Special features |

| CODE             |                  | D1   | L2 | L1  | D2 |
|------------------|------------------|------|----|-----|----|
| 0640-424-300-100 |                  | 1    | 6  | 50  | 4  |
| 0640-424-300-150 |                  | 1,5  | 9  | 50  | 4  |
| 0640-424-300-160 |                  | 1,6  | 10 | 50  | 4  |
| 0640-424-300-200 |                  | 2    | 12 | 50  | 4  |
| 0640-424-300-250 |                  | 2,5  | 15 | 50  | 4  |
| 0640-424-300-300 | 0640-424-600-300 | 3    | 28 | 66  | 4  |
| 0640-424-300-320 | 0640-424-600-320 | 3,2  | 28 | 66  | 4  |
| 0640-424-300-330 | 0640-424-600-330 | 3,3  | 28 | 66  | 4  |
| 0640-424-300-350 | 0640-424-600-350 | 3,5  | 28 | 66  | 4  |
| 0640-424-300-400 | 0640-424-600-400 | 4    | 36 | 66  | 4  |
| 0640-424-300-420 | 0640-424-600-420 | 4,2  | 36 | 74  | 6  |
| 0640-424-300-450 | 0640-424-600-450 | 4,5  | 36 | 74  | 6  |
| 0640-424-300-500 | 0640-424-600-500 | 5    | 44 | 82  | 6  |
| 0640-424-300-520 | 0640-424-600-520 | 5,2  | 44 | 82  | 6  |
| 0640-424-300-550 | 0640-424-600-550 | 5,5  | 44 | 82  | 6  |
| 0640-424-300-600 | 0640-424-600-600 | 6    | 44 | 82  | 6  |
| 0640-424-300-650 | 0640-424-600-650 | 6,5  | 53 | 91  | 8  |
| 0640-424-300-680 | 0640-424-600-680 | 6,8  | 53 | 91  | 8  |
| 0640-424-300-700 | 0640-424-600-700 | 7    | 53 | 91  | 8  |
| 0640-424-300-750 | 0640-424-600-750 | 7,5  | 53 | 91  | 8  |
| 0640-424-300-800 | 0640-424-600-800 | 8    | 53 | 91  | 8  |
| 0640-424-300-850 | 0640-424-600-850 | 8,5  | 61 | 103 | 10 |
| 0640-424-300-900 | 0640-424-600-900 | 9    | 61 | 103 | 10 |
| 0640-424-300-950 | 0640-424-600-950 | 9,5  | 61 | 103 | 10 |
| 0640-424-301-000 | 0640-424-601-000 | 10   | 61 | 103 | 10 |
| 0640-424-301-020 | 0640-424-601-020 | 10,2 | 71 | 118 | 12 |
| 0640-424-301-050 | 0640-424-601-050 | 10,5 | 71 | 118 | 12 |
| 0640-424-301-100 | 0640-424-601-100 | 11   | 71 | 118 | 12 |
| 0640-424-301-150 | 0640-424-601-150 | 11,5 | 71 | 118 | 12 |
| 0640-424-301-200 | 0640-424-601-200 | 12   | 71 | 118 | 12 |
| 0640-424-301-250 | 0640-424-601-250 | 12,5 | 77 | 124 | 14 |
| 0640-424-301-300 | 0640-424-601-300 | 13   | 77 | 124 | 14 |

| ISO |     | MATERIAL  | HARDNESS  | DURABILITY              | Vc      | mm/blade    |            |            |           |           |
|-----|-----|---|-----------|-------------------------|---------|-------------|------------|------------|-----------|-----------|
|     |     |   | [HRC]     | Rm [N/mm <sup>2</sup> ] | [m/min] | ø 2 - 4     | ø 4 - 8    | ø 8 - 12   | ø 12 - 16 | ø 16 - 20 |
| P   | 1.1 | Low carbon, free-cutting, unalloyed steels                              | < 22      | ≤ 800                   | 80-160  | 0,01-0,02   | 0,02-0,03  | 0,03-0,04  | 0,04-0,05 | 0,05-0,08 |
|     | 1.2 | Unalloyed and alloyed steels containing (<0,5%C - <0,5%C)               | < 32      | ≤ 1000                  | 50-110  | 0,009-0,01  | 0,01-0,02  | 0,02-0,03  | 0,03-0,04 | 0,04-0,05 |
|     | 1.3 | Alloyed tool, high-alloy steels with high hardness and durability       | < 44      | ≤ 1400                  | 30-65   | 0,008-0,01  | 0,01-0,015 | 0,015-0,02 | 0,02-0,03 | 0,03-0,05 |
| M   | 2.1 | Stainless and acid-resistant steels                                     |           | ≤ 850                   | 40-80   | 0,006-0,02  | 0,02-0,04  | 0,04-0,06  | 0,06-0,08 | 0,08-0,09 |
|     | 2.2 | Stainless and acid-resistant steels with increased content of Cr and Ni |           | 850 - 1000              | 20-65   | 0,005-0,015 | 0,015-0,03 | 0,03-0,04  | 0,04-0,05 | 0,05-0,06 |
| K   | 3.1 | Gray, malleable cast, iron spheroidal                                   |           | ≤ 700                   | 60-130  | 0,01-0,03   | 0,03-0,06  | 0,06-0,08  | 0,08-0,09 | 0,09-0,10 |
|     | 3.2 | High-alloy, troublesome cast iron                                       |           | 700 - 1000              | 50-100  | 0,008-0,02  | 0,02-0,03  | 0,03-0,04  | 0,04-0,05 | 0,05-0,07 |
| N   | 4.1 | Aluminum, copper  |           |                         | 60-250  | 0,01-0,02   | 0,02-0,04  | 0,04-0,06  | 0,06-0,08 | 0,08-0,10 |
|     | 4.2 | Aluminum alloy, copper alloy  |           |                         | 140-350 | 0,01-0,02   | 0,02-0,05  | 0,05-0,08  | 0,08-0,12 | 0,12-0,15 |
|     | 4.3 | Plastic, composites   |           |                         | 90-350  | 0,01-0,03   | 0,03-0,05  | 0,05-0,08  | 0,08-0,10 | 0,10-0,15 |
| S   | 5.1 | Titanium, titanium alloy  |           | ≤ 1250                  | 30-65   | 0,01-0,03   | 0,03-0,04  | 0,04-0,05  | 0,05-0,06 | 0,06-0,08 |
|     | 5.2 | Superalloy based on Fe, Ni, Co  |           | ≤ 1600                  | 20-55   | 0,005-0,02  | 0,02-0,03  | 0,03-0,04  | 0,04-0,05 | 0,05-0,07 |
| H   | 6.1 | Hardened and improved steel alloys                                      | >42 - <50 |                         | 25-60   | 0,005-0,02  | 0,02-0,03  | 0,03-0,04  | 0,04-0,05 | 0,05-0,06 |
|     | 6.2 | Hardened and improved steel alloys                                      | >50 - <55 |                         | 20-50   | 0,005-0,02  | 0,02-0,03  | 0,03-0,04  | 0,04-0,05 | 0,05-0,06 |
|     | 6.3 | Hardened and improved steel alloys                                      | >55 - <65 |                         | 20-50   | 0,005-0,02  | 0,02-0,03  | 0,03-0,04  | 0,04-0,05 | 0,05-0,06 |

**WARNING:** For extended end mills type L and XL parameters Vc and fz should be properly reduced.

### VHM END MILLS USE ACCORDING TO ISO MATERIALS

|              | P   |     |     | M   |     | K   |     | N   |     |     | S   |     | H   |     |     |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ISO Material | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 5.1 | 5.2 | 6.1 | 6.2 | 6.3 |
| Line         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| General      | ●   | ●   | ●   | ○   | ○   | ●   | ○   |     |     |     | ○   |     | ○   |     |     |
| Gold         | ●   | ●   | ●   | ○   | ○   | ●   | ●   |     |     |     | ●   | ○   | ●   | ●   |     |
| Blue         | ●   | ●   | ●   | ○   | ○   | ●   | ○   |     |     |     | ●   | ●   | ●   | ●   | ●   |
| INOX         | ●   | ○   | ○   | ●   | ●   | ●   | ●   |     |     |     | ●   | ●   | ●   | ●   | ●   |
| ALU          |     |     |     |     |     |     |     | ●   | ●   |     |     |     |     |     |     |
| ALU DLC      |     |     |     |     |     |     |     | ●   | ●   |     |     |     |     |     |     |
| PVC          |     |     |     |     |     |     |     |     |     | ●   |     |     |     |     |     |
| WIN          |     |     |     |     |     |     |     | ●   | ●   | ●   |     |     |     |     |     |
| WIN DLC      |     |     |     |     |     |     |     | ●   | ●   | ●   |     |     |     |     |     |

● - recommended      ○ - acceptable





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